What is claimed is:

1. A reinforced composite ionic conductive polymer membrane comprising:

a porous support;

an ion-exchange polymer that impregnates the porous support; and

a reinforcing agent that impregnates the porous support, the reinforcing agent being at least one selected from the group consisting of a moisture retentive material and a catalyst for facilitating oxidation of hydrogen.

2. The reinforced composite ionic conductive polymer membrane as claimed in claim 1, wherein the moisture retentive material comprises at least one selected from the group consisting of SiO_2, TiO_2, ZrO_2, mordenite, tin oxide, and zeolite.

3. The reinforced composite ionic conductive polymer membrane as claimed in claim 1, wherein the catalyst comprises at least one selected from the group consisting platinum (Pt), palladium (Pd), ruthenium (Ru) rhodium (Rh), iridium (Ir), gold (Au), and a Pt/Ru alloy.

4. The reinforced composite ionic conductive polymer membrane as claimed in claim 1, wherein the reinforcing agent comprises about 3-90% by weight of the moisture retentive material and about 10-97% by weight of the catalyst, based on the total weight of the reinforcing agent.

5. The reinforced composite ionic conductive polymer membrane as claimed in claim 1, wherein the ion-exchange polymer includes at least one selected from the group consisting of a sulfonic acid group, a carboxyl group, a phosphoric acid group and a perchloric acid group as a reactive site and has an equivalent weight of about 600-1200 g/H^+.

6. The reinforced composite ionic conductive polymer membrane as claimed in claim 1, wherein the porous support comprises at least one polymer membrane that has at least about 30% porosity.

7. The reinforced composite ionic conductive polymer membrane as claimed in claim 1, wherein the porous support comprises at least one polymer membrane that is selected from the group consisting of polytetrafluoroethylene, vinylidene fluoride-hexafluoropropylene copolymer, polypropylene, polyethylene, and polysulfone.

8. The reinforced composite ionic conductive polymer membrane as claimed in claim 1, wherein at least one functional group selected from the group consisting of a carboxyl group, a sulfonic acid group, a phosphoric acid group, and a perchloric acid group is incorporated into the polymer membrane.

9. The reinforced composite ionic conductive polymer membrane as claimed in claim 1 which is formed by impregnating or spray-coating the porous support with a composition of the ion-exchange polymer and the reinforcing agent.

10. A fuel cell comprising a reinforced composite ionic conductive polymer membrane, the membrane comprising:

a porous support;

an ion-exchange polymer that impregnates the porous support; and

a reinforcing agent that impregnates the porous support, the reinforcing agent being at least one selected from the group consisting of a moisture retentive material and a catalyst for facilitating oxidation of hydrogen.

11. The fuel cell as claimed in claim 10, wherein the moisture retentive material comprises at least one selected from the group consisting of SiO_2, TiO_2, ZrO_2, mordenite, tin oxide, and zeolite.

12. The fuel cell as claimed in claim 10, wherein the catalyst comprises at least one selected from the group consisting platinum (Pt), palladium (Pd), ruthenium (Ru) rhodium (Rh), iridium (Ir), gold (Au), and a Pt/Ru alloy.

13. The fuel cell as claimed in claim 10, wherein the reinforcing agent comprises about 3-90% by weight of the moisture retentive material and about 10-97% by weight of the catalyst, based on the total weight of the reinforcing agent.

14. The fuel cell as claimed in claim 10, wherein the ion-exchange polymer includes at least one selected from the group consisting of a sulfonic acid group, a carboxyl group, a phosphoric acid group, and a perchloric acid group as a reactive site and has an equivalent weight of about 600-1200 g/H^+.

15. The fuel cell as claimed in claim 10, wherein the porous support comprises at least one polymer membrane that has at least about 30% porosity.

16. The fuel cell as claimed in claim 10, wherein the porous support comprises at least one polymer membrane selected from the group consisting of polytetrafluoroethylene, vinylidene fluoride-hexafluoropropylene copolymer, polypropylene, polyethylene, and polysulfone.

17. The fuel cell as claimed in claim 10, wherein at least one functional group selected from the group consisting of a carboxyl group, a sulfonic acid group, a phosphoric acid group, and a perchloric acid group is incorporated into the polymer membrane.

18. The fuel cell as claimed in claim 10, wherein the reinforced composite ionic conductive polymer membrane is formed by impregnating or spray-coating the porous support with a composition of the ion-exchange polymer and the reinforcing agent.

19. A direct methanol fuel cell comprising a reinforced composite ionic conductive polymer membrane, the membrane comprising:

a porous support;

an ion-exchange polymer that impregnates the porous support; and

a reinforcing agent that impregnates the porous support, the reinforcing agent being at least one selected from the group consisting of a moisture retentive material and a catalyst for facilitating oxidation of hydrogen.

20. The direct methanol fuel cell as claimed in claim 19, wherein the porous support comprises at least one polymer membrane that has a porosity of at least about 30% and a proton exchange functional group.

21. The direct methanol fuel cell as claimed in claim 19, wherein the porous support comprises at least one polymer membrane selected from the group consisting of polytetrafluoroethylene, vinylidene fluoride-hexafluoropropylene copolymer, polypropylene, polyethylene, and polysulfone.

22. The direct methanol fuel cell as claimed in claim 20, wherein the proton exchange functional group is at least one selected from the group consisting of a carboxyl group, a sulfonic acid group, a phosphoric acid group, and a perchloric acid group.

23. A method of forming a reinforced composite ionic conductive polymer membrane, the method comprising the steps of:

providing a porous support;

forming a mixture of an ion-exchange polymer and a reinforcing agent, the reinforcing agent being at least one selected from the group consisting of a moisture retentive material and a catalyst for facilitating oxidation of hydrogen, and

impregnating the porous support with the mixture.